Determinants of the neuropsychological development of schoolchildren and adolescents

van Tetering, M.A.J.

2018

document version
Publisher's PDF, also known as Version of record

SUMMARY

There are substantial differences in the school achievements, cognitive and behavioral development of boys and girls, and of children of lower and higher educated parents. These differences may be attributed to sex differences and differences between children of lower and higher educated parents in their neuropsychological development. The studies in this thesis therefore aimed to investigate individual differences in neuropsychological abilities of preadolescents and adolescents aged 7–19 years. The investigated abilities included executive functions and self-regulatory skills. Of special interest were the perceptions that teachers and parents have about the executive functions and self-regulatory skills of the student/child, as well as the perceptions of adolescents themselves. The influences of sex and parental education were also evaluated on the ability to learn pictorial information, and on mental rotation ability. A general introduction to the determinants and learning processes that were investigated in this thesis can be found in chapter 1.

Individual differences in neuropsychological development

Chapter 2, 3, 4 and 5 focus on individual differences in the neuropsychological abilities of preadolescents and adolescents. The study described in chapter 2 examined age and sex differences, and differences between children of higher and lower educated parents in executive functions as perceived by teachers. Participants included 186 preadolescents and adolescents aged 9–12 years old. Teachers evaluated three important components of the students' executive functions, i.e., attention, planning/initiative taking and self-control/self-monitoring. These components were administered using the Amsterdam Executive Functioning Inventory (the AEFI), which is an observer-report questionnaire consisting of 13 items. Results revealed a significant increase in teacher-perceived executive functions with grade. This development was influenced both by the sex of the child and by the level of parental education. As perceived by teachers, the component self-control/self-monitoring was higher for girls than for boys, and planning abilities were higher for children from higher educated parents than for children from lower educated parents. Additional analyses showed that there is a systematic and statistically significant difference between the evaluations of the teachers and that of parents. Parents reported higher scores for planning whereas teachers reported higher scores for self-control/self-monitoring. Evaluations by parents were different from those of teachers in the case of girls, but not for boys.

Chapter 4 elaborated on these findings and investigated differences in teacher-perceived executive functions and self-regulatory skills of children with high versus low school achievement. It additionally investigated differences between children of higher and lower educated parents. Participants were 8– 12 years old. Results showed that teachers evaluated the executive functions and self-regulatory skills of students with low achievement in mathematics, spelling, and reading comprehension as significantly lower than that of children with high achievements on these three topics. Moreover, teachers evaluated the attention and self-control/self-monitoring as higher for children from higher educated parents than for children from lower educated parents. These findings suggest that executive functions are highly important to school achievement, and the development of particular executive functions seems to lag behind in children of lower educated parents as compared to children of higher educated parents. A finding with applied potential is that teacher evaluations can be considered of value in school practice.

Sex differences and differences between children of higher and lower educated parents were investigated on another factor underlying school performance – learning pictorial information

- in chapter 3. Intentional learning was assessed with the Pictorial Verbal Learning Task, which presents line drawings of concrete objects as to-be-remembered information. Participants included 152 young adolescents aged 8–12 years. Results revealed clear sex-differences in performance: Girls outperformed boys. Parental education also contributed to individual differences in performance since children from higher educated parents outperformed children from lower educated parents. Sex differences and differences between children of higher and lower educated parents were only observed when information was presented for the first time. This finding indicates that both children from less educated parents and boys need additional guidance and support in intentional learning when new information and procedures are presented for the first time.

Chapter 5 also examined boy-girl differences, but this time on mental rotation ability. From the age of ten, it has amply been documented that boys outperform girls on mental rotation tasks. It is, however, not clear whether this sex difference exists in younger children because there are no tasks suitable for evaluating mental rotation in young children. We therefore renewed an existing task: The Mental Rotation Task – Children, for investigating mental rotation performance in children below the age of ten years. This task has a binary response approach in which children are required to indicate whether two graphic representations of three-dimensional cuboid figures are the same or not. Participants in this study involved 729 young adolescents (7–12 years). Results revealed a sex difference in the number of correct judgements made in the mental rotation task. This boy-girl difference was confined to 7– to 9–year–old children. Boys performed better than girls. A closer look at the distribution of boys and girls in this age group showed that boys were overrepresented in the top performance quartile, whereas girls were represented in the lower performance quartile. This is the first study to provide evidence that by the age of 7–9 years, boys are outperforming girls at mental rotation.

Chapter 6 additionally examined sex differences – this time – in self-regulation and self-insight in the period of mid-adolescence. It has been well established that adolescent boys and girls differ in academic achievements and in cognitive and behavioral development. Previous studies reported on the importance of self-regulation and self-insight to academic achievement and behavioral problems. It is therefore tempting to relate boy-girl differences in academic achievements and behavioral problems to differences in their self-regulation and self-insight. This study investigated differences in the self-regulation and self-insight in more than 450 adolescent boys and girls aged 10–19 years. Sex differences were investigated in the three age-ranges of young, middle and late adolescence. Self-regulation and self-insight were evaluated with a self-report questionnaire: the Amsterdam Executive Functioning Inventory

(AEFI). Results revealed sex differences in the period of middle adolescence (i.e., 13–16 years). Girls reported higher levels of self-regulation than boys. This finding is important for educational practice and policy because it offers explanations for the sex differences that exist in school performances and problem behavior, especially in the period of middle adolescence. It appears that boys need special attention in this age period, because they are at risk for poor school performance and behavioral problems.

Chapter 7 elaborated on these findings and investigated the importance of self-regulation and self-insight to delinquency in mid-adolescence. The prevalence of youth delinquency increases from early to mid-adolescence until the age of 16–17 years and then declines throughout late-adolescence and emerging adulthood. Skills in the domain of self-regulation and self-insight may play a key role in this process. The goal of this study was therefore to evaluate the importance of self-regulation and self-insight to delinquency amongst a group of 554 juveniles in mid-adolescence (aged 14–18 years). Self-regulation and self-insight were evaluated with a self-report questionnaire: the Amsterdam Executive Functioning Inventory. This questionnaire consists out of three subscales (1) self-control/self-monitoring, (2) attention, and (3) planning/initiative taking. As the AEFI was used as a self-report, it provides information on the self-insight of the responder. Moreover, as self-control and self-monitoring, attention and planning and initiative taking are important executive functions for self-regulation, the sum of these three subscales is a robust proxy for self-regulation and self-insight. We additionally investigated the unique contribution of self-insight with respect to attention and planning/initiative taking to delinquency. Results revealed a that self-regulation and self-insight were significantly associated to delinquency. The association between attention and delinquency was also significant. It appears that the lower individuals perceive their ability to self-regulate and to pay attention, the more likely they perceive themselves to participate in delinquent acts.

Concluding remarks

Finally, the main conclusions of this thesis together with innovations and suggestions for future research are presented in chapter 8. It was emphasized that sex and parental education are important sources of variability in school performance during adolescence. Furthermore, educational interventions were discussed to enhance the neuropsychological development of adolescents. Of particular relevance are interventions that stimulate the development of executive functions and self-regulatory skills, as both are important for performance at school. Also, the role of parents and teachers in stimulating neuropsychological development was described and suggestions were given for how to do this.

In sum

In this thesis, the adolescent was studied considering information of the adolescents themselves, as well as information about their functioning as perceived by teachers at school, and by parents at home. In this way, a bridge between three different dimensions of the adolescent is built from a neuropsychological perspective. Neuropsychology – which has its origins in clinical practice in the investigation, diagnosis and training of brain damaged patients – improved our understanding about normal neuropsychological development in preadolescence and adolescence in relation to school achievement.